

steam tables shows that the saturation pressure at 86° F. is 1-24.8 in. Thus the partial pressure of the air, P_a , is

$$P_a = 1.508 - 1.248 = 0.26$$

in. = 18.4 lb. per square foot,
and the volume V of 1 lb. of this
air is given by

If the air is saturated at 86° F.,
the volume of 1 lb. steam given by
steam tables is 529 c. it.

$$\begin{array}{r} \text{Weight of vapour} \\ \hline 1580 \\ \dots \end{array}$$

But if the mixture were cooled to 79° F., say, before reaching the air-pump with the same total pressure 1.508 in., the partial pressure of the air would be 0.512 in., the volume of 1 lb. air would be reduced to 792 c. ft., with a corresponding reduction of the effective displacement of the air-pump, and the weight of vapour per pound

Fig. 14.—Outline of Reciprocating Air-pump.

of air would be reduced to 1.21 lb.



Reciprocating Air-pumps.—A common form of air-pump is illustrated in outline in fig. 14, and is usually operated as a wet air-pump. The mixture of air and water passes from the

condenser through the foot valves at the bottom on the up-stroke of the bucket. On the down-stroke a vacuum is formed on the top side of the bucket, and when the pressure there is slightly below that under the bucket the air flows through the bucket valves to the top side. Eventually the bucket reaches the water lying at the bottom of the barrel towards the end of the down-stroke, and the water also flows through the bucket valves. On the next up-stroke the air is compressed until it attains a pressure slightly greater than that over the

During the final head valves, after which it is delivered through these valves, portion of the up-stroke the water also is delivered;

remains, filling up
the clearance
space.

A consideration of this action shows that the foot valves are not absolutely necessary, and they are sometimes dispensed with, partly because of the difficulty of getting to these valves for inspection and repair in an emergency.

In the case of slow-speed reciprocating engines, usually an air-pump of this type is directly connected to the engine crosshead through simple